The bubble user interface: a tangible representation of information to enhance the user experience in IPTV systems

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Abstract
Media consumption in the IPTV sector has changed over the past years and decades. It evolved from a linear viewing behavior on just one device, the TV with a few channels, to a connected home entertainment environment with multiple screens. Also user interfaces need to adapt to these new requirements and ensure a good user experience and meet the consumers' needs for natural, straightforward and pleasant method of interacting with their IPTV systems. We have developed a new kind of user interface as a tailor-made alternative to current list or grid menus in order to not only address current limitations of list and grid menus, but to offer a novel and unique way to interact with TV content that makes using an interactive system an event again.

Introduction
A large variety of functionalities and an almost endless amount of content is available for today's IPTV users. This development is a consequence of changes in media consumption, which altered from a linear viewing behavior on just one device - the TV - to a connected multi-screen home entertainment environment.

Figure 1. The Bubble User Interface, the matching Remote Control and Set-Top-Box

Figure 2. IPTV user interfaces from the French market: Freebox Revolution's EPG and SFR's VOD catalog, using grids and tables visual metaphor.

In order to keep up with this development, also user interfaces need to adapt to these new requirements and support the users with easy and intuitive menu structures. At the same time, those menus should offer interaction mechanisms that can deal with this variety of content and functionality. TV user interfaces and their input devices have to ensure a good user experience and meet the consumers' needs for natural, straightforward and pleasant method of interacting with their IPTV systems.

Keeping in mind the increasingly complex TV ecosystem, our research goal was thus to provide a tailor-made alternative to current list or grid menus that provides an easy and intuitive way to navigate in large quantities of content items. Furthermore, it should improve the currently existing interface design metaphors and enable the user to engage with their TV services in a novel and playful way, improving the overall user experience. In order to address our research goal, we have developed a new kind of user interface in order to not only address current limitations of list and grid menus, but to offer a novel and unique way to interact with TV content that makes using an interactive system an event again. To follow up this increasing amount of content and functionalities, IPTV user interfaces have become increasingly complex and cluttered. As shown in Figure 2, while focusing on the information to be displayed, they are forgetting their primary goal: allow the user to enjoy watching television.

As every user interface needs an interaction mechanism, these cluttered user interfaces often come along with a complex, unappealing and bulky remote control that often makes the activity of watching television a painful task. Finally, one common issue in IPTV graphical user interfaces is that they present complex information in a very abstract way, using endless variations of grid-based user interfaces.

Can an interactive user interface present numerous and complex information in a more tangible way, closer to the user's mood of watching his TV content? To answer this question we decided to propose a new consistent TV ecosystem, including the graphical user interface (GUI), the remote control (RC) and the set-top-box (STB). Based on previous studies [1] we started the iterative design process of the GUI concept. The design propositions were evaluated by an expert to match the user's needs and the aesthetic goals which led us to a first version of the Bubble User Interface concept, a dynamic alternative solution in representing IPTV contents that brings the pleasure of watching TV back to the user (Figure 1). Subsequently, we started the implementation of the prototype while iterating the design aspects, leading to a second version of the Bubble User Interface that we present in this paper. The RC and the STB were then designed and built to match the GUI concept, in order to perform future user tests.

A real-world visual metaphor to break with cluttered interfaces

The concept of the Bubble user interface consists in mapping to an abstract content (IPTV information) a tangible, non-cultural oriented material that everyone can recall (soap bubbles). The goal is to implicitly add a feeling of lightness and clarity to the information in a way that a user would enjoy interacting with, while keeping the overall consistency that a graphical user interface needs.

Figure 3. Using the visual metaphor to represent the different elements and content of the user interface

To achieve this vision, we used the visual metaphor of soap bubbles and included it as a primary component of the user interface, applying its physical properties and embodied meanings to the representation of the information. The fact that soap bubbles are multiple, numerous objects, while being physically the same allowed us to use it as a primary component of an interface, ensuring consistency through the different parts of the interface. Each piece of information is encompassed into one soap bubble, giving it a familiar texture that would help the user to interact with.

Shaping soap bubbles to IPTV content additionally gave us the possibility to provide a solution for every kind of TV display (stereoscopic and non-stereoscopic), and to take advantage of the third dimension to display the large amount of content that IPTV systems require. Furthermore, they are transparent objects, which allowed us to avoid the recurrent problem in 3D UIs [2] that they quickly appear to be very clumsy and not easy to use, especially in dense environments.

Although we solved the problem of item selection in a dense 3D environment by dedicating an area of the screen to the selection process, the transparency of the soap bubbles allows the user to preview further items in the interface and thus anticipate his selection process (Fig. 3.).

This also allowed presenting a large amount of content available on sight for the user, while keeping the desired concept of clarity and clearness. Yet, in order to lower the cognitive load of the user, only the first seven items are clearly readable.

Semiotic of soap bubbles

Soap bubbles could stand for a visual definition of lightness, clarity and enjoyment, all meanings that fit our goal to provide not only simple, easily understandable information but also a playful and pleasant interaction.

As stated by Cox [3], the visual juxtaposition of two different elements engages the cognitive process of mapping the properties of one (the source domain) to the other (the target domain). When confronted to IPTV contents (target domain) encompassed into soap bubbles (source domain), the user will map the physical properties of a soap bubble (lightness, airiness…) and some of his personal experiences (blowing a soap bubble, playing with it, having fun) to the IPTV content. By doing so, he is now able to reconsider his TV content and the numerous features that come along in a completely different way.

Several experiments have been made in terms of representation and interaction techniques, from mixing computed soap bubbles and the user's actions [4], to using real soap bubbles as an input to interact with interactive contents [5]. Soap bubbles are natural objects that are universally known. Their very specific nature has been of interest for both artists and scientists [6], and their physical properties can be experienced by anyone. This is an important point that a large majority of the users confronted to soap bubbles will instantly be able to identify a soap bubble and be able to predict or expect its behavior, just by recalling his personal experience.

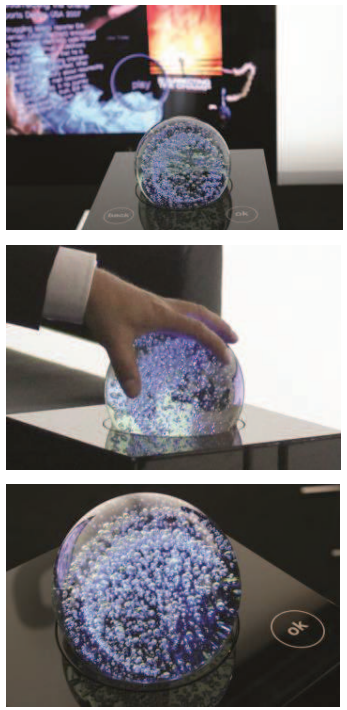

Figure 4. The interaction mechanism, designed to match the user interface and thus providing a consistent solution

A custom-tailor interaction mechanism

Alongside with the soap bubble metaphor used in the graphical user interface, a custom-tailored interaction mechanism has been designed to match the graphical user interface (figure 4), to keep the overall concept consistent and to better support the user's activity of watching television. This interaction mechanism allows the user to directly manipulate the soap bubbles in the synchronized user interface. Following the principles of simplicity of the user interface, the number of buttons on the remote control has been reduced to a minimum, favoring one central rounded input dedicated to the navigation, and offering a more analogue way to navigate through content. In order to closely follow the user's actions, this analog input is visually translated through the interface in a sequence of animations: rolling or moving the orb allows the user to move through the three dimensional interface either selecting or avoiding the soap bubbles on the screen.

To keep the overall concept consistent, the input device resembles a sphere and offers the opportunity to navigate within the dynamic user interface in an easy way. The tactile feeling of the input device allows a fast and intuitive navigation within the 3D UI and thus enables a playful and pleasant interaction experience for the user, giving him the possibility to move his point of view in the 3D space in order to browse the content.

Summary

Using the soap bubble visual metaphor to represent information allowed us to create a 3D interface that takes advantage of the third dimension to display a lot of information, while at the same time avoiding the issue of a cluttered environment by using the soap bubble's transparency property.

To keep the overall system consistent, we designed an interaction mechanism that matches the user interface to facilitate the user's interaction with the system. We lowered the number of keys to reduce the user's cognitive load, while a proper mapping of analog inputs in the user interface allows a more sensible and playful way to interact with the system. Finally, the use of the visual metaphor of soap bubbles allows to implicitly applying the embodied meanings of airiness, clarity and playfulness to the complex information presented by the system, bringing back the pleasure of watching TV into the living room.

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